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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/881,122	06/15/2001	Eberhard Pantow	016906-0220	7929

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WASHINGTON, DC 20007

EXAMINER

DUONG, THO V

ART UNIT	PAPER NUMBER
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3743

DATE MAILED: 03/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/881,122

Applicant(s)

PANTOW ET AL.

Examiner

Tho v Duong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,7,8,10-12 and 14-23 is/are pending in the application.
- 4a) Of the above claim(s) 17 and 21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,7,8,10-12,14-16,18-20,22 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☒ Interview Summary (PTO-413) Paper No(s). 20.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other: _____

DETAILED ACTION***Response to Arguments***

Applicant's arguments with respect to claims 1-5, 7-8, 10-12, 14-16 and 18-20 have been considered but are not found to be persuasive. Applicant's argument that none of the prior art disclose the reference to Rhodes does not disclose any row spacing in the longitudinal direction and it is inappropriate to derive a ratio from the drawing, has been very carefully considered but is not deemed to be persuasive. Rhodes discloses (figure 3) that vortex generator rows are offset from the first surface (20) to the second surface (22). Furthermore, Rhodes discloses that Figure 6 is a side view of the tube viewed in figure 3. Therefore, the distance between two adjacent vortex generators (152) is the row distance which has been seen in Figure 3. Regarding to the validity of deriving a ratio from measurement taken on the drawing, according to the MPEP, 37 CFR 1.84 (k).(3) "elements of the same view must be in proportion to each other, unless a difference in proportion is indispensable for the clarity of the view". Since all elements shown in Figure 6 should be in proportion, the derived ratio taken from the same view of Figure 6 is valid.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 10, 11, 18 and 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claim 11, the claimed subject matter of "the flat tubes are beaded tubes, with a bead running parallel to the tube longitudinal axis" renders the scope of the claim indefinite since it appears in the drawings that all the beads are angled with

the longitudinal axis and none of them appears to be parallel with the longitudinal axis.

Regarding claims 10,18 and 23, the claimed subject matter of "the vortex generator rows are arranged offset at an angle" renders the scope of the claim indefinite since it is not clear at what relative axis that the vortex generator row are arranged offset with. The angle can be "a" with one relative axis but "b" with other relative axis.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 7, 8,12,14-16 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck et al. (US 6,070,616) in view of Rhodes (US 4,470,452) and Damsohn et al. (US 6,321,835). Beck discloses (figures 1,2 and column 20-22) a heat exchanger comprising a plurality of flat tubes (10); elongated vortex generators (13,14) in the form of indentation pointing inward of at least one flat face of the flat tube wherein the vortex generators (13,14) which are adjacent transversely with respect to the tube longitudinal axis, are inclined in opposite directions. Beck further discloses (column 2, lines 45-50) that the vortex generator rows formed on the first flat surface (11) and the second flat surface (12) arranged in alternating relationship with respect to one another in the direction of the tube longitudinal axis. Beck further discloses (column 2, lines 34-38) that a ratio between a height of the vortex generator and a height of the flat tube is a fourth (0.25, 25%) to a third (0.33, 33%). Basing on geometrical relationship shown in figure 2, Beck discloses that the inclined angle of the vortex generators (13,14) is

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within 10 degrees to 40 degrees with respect to the tube longitudinal axis. Beck does not disclose limitations including corrugated fins; at least three vortex generators; the ratio of distance between vortex generator rows to the length of the vortex generator; the ratio of transverse distance between the vortex generators to the length of the vortex generator; and the ratio of the distance between the first flat face and the second flat face of the vortex generator rows to the height of the vortex generator. Rhodes discloses (figures 1, 7C and column 3, lines 54-61) that a heat exchanger comprising a plurality of flat tubes having rows of at least three vortex generators (152) run transversely with respect to the tube longitudinal axis in a straight line and corrugated fins (16) in contact with the tubes to increase heat transfer from a coolant flowing through the tubes per unit volume of the heat exchanger. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Rhodes's teaching in Beck's device to increase heat transfer from a coolant flowing through the tubes per unit volume of the heat exchanger. Basing on geometrical relationship shown in figure 6, Rhodes discloses that a ratio between the vortex generator rows of the first flat surface (120) and the second flat surface (126) to the height of the vortex generator is about 7. It would have been obvious matter of design choice to select the ratio in range of 10 to 30 in view of Rhodes, since applicant has not disclosed that the ratio in range of 10-30 solves any stated problem or produces any new and/or unexpected result and it appears that the invention would perform equally well with the ratio of 7. Damsohn discloses (figures 5 and 7) a heat exchanger that has a plurality of flat tubes (19) having a plurality of rows of vortex generators (23,24) formed thereon. Basing on the geometrical relationship of figure 7, Damsohn discloses that the ratio of distance between rows of vortex generator to the length of the vortex generator is about 5 and the ratio of

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transverse distance between the vortex generators to the length of the vortex generator is within 0.1 to 0.9 to improve the heat transfer rate of the tube. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Damsohn's teaching in the combination device of Beck and Rhodes to improve heat transfer rate of the tubes.

Claims 10, 18, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck, Rhodes and Damsohn as applied to claims 5 and 10 above, and further in view of Robert (US 3,664,928). Beck, Rhodes and Damsohn substantially disclose all of applicant's claimed invention as discussed above except for the limitation that the pitch between two adjacent vortex generator rows is 6mm and the angle (β) is 20 degrees. Robert discloses (figures 6, and column 4, lines 68-76) a heat transfer wall having a plurality of vortex generators (31) which are arranged in row with a pitch (P) in longitudinal direction of 0.1875 in (4.76mm) to 1.25 in (31mm) and offset at an angle (θ) in a range of 0 and 90 degrees to divert the flowing fluid (44) by the various vortex generators through a tortuous path between the vortex generator in order to provide more heat transfer effectiveness of the heat transfer wall. It is obvious to a person having ordinary skill in the art to know that the claimed angle of 20 degrees lies within the range of 0 to 90 degrees and 6 mm lies within 4.76mm to 31mm. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Robert's teaching in the combination device of Beck, Rhodes and Damsohn to divert the flowing fluid by various vortex generator through a tortuous path between the vortex generator in order to provide more heat transfer effectiveness of the heat transfer tubes.

Conclusion

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The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kiser et al. (US 5,730,213) discloses a cooling tube for heat exchange that has rows of vortex generators.

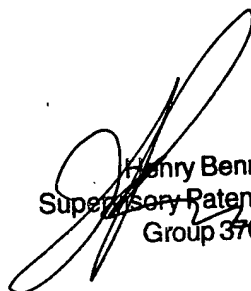
Any inquiry concerning this communication or earlier communication from the examiner should be directed to Tho Duong whose telephone number is (703) 305-0768. The examiner can normally be reached on from 9:30-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Henry Bennet, can be reached on (703) 308-0101. The fax phone number for the organization where this application or proceeding is assigned is (703)308-7764.

Any inquiry of a general nature or relating to status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0861.

Tho Duong

March 20, 2003


Henry Bennett
Supervisory Patent Examiner
Group 3700